A F & P A

AMERICAN FOREST & PAPER ASSOCIATION
Regulatory Affairs

June 21, 1999

Margaret Sheppard
U.S. Environmental Protection Agency
Acid Rain Division
401 M Street, SW
Mail Code 6204J
Washington, DC 20460

Re: Comments of the American Forest & Paper Association on Output-Based Emission Limitations

Dear Ms. Sheppard:

AF&PA is pleased to submit comments on steam measurement and industrial boilers, and more generally on the use of output-based emission limitations for industrial boilers.

Overall, AF&PA has significant concerns about the application of output-based emission limitations to industrial boilers. Our concerns stem from the significant differences between utility and industrial boilers, differences which have, up to this point, precluded universal application of output-based emission limitations. While the application of such emission limitations to forest products boilers is not entirely infeasible, there are some significant issues which must be addressed to account for the uniqueness of the industrial sector.

Industrial boilers used within the forest products industry vary widely in terms of age, size, type, and firing method. Our boilers often fire two or more types of fuel (e.g., bark, wood chips, oil, coal, pulping residues, and/or non-recyclable fiber) simultaneously, unlike most utility boilers, which are designed to fire a single fuel. Moreover, our units typically are much smaller than utility boilers, producing 10,000 to 500,000 pounds of steam per hour compared to the 3.5 million pounds of steam at a typical utility boiler. Forest product mill boilers typically operate in a load-following mode based on energy demand, versus utility boilers which are designed to generate steam at a constant rate to produce electricity. Load swings of 50,000 lb/hr/minute or more are not uncommon for our boilers, compared to typical load swings of less than 5,000 lb/hr/minute for the much larger utility boilers. In addition, biomass fuels are a major source of fuel in the forest products industry. These fuels are, by their nature, "lower efficiency" fuels due to their moisture content, low and variable heating value, and non-homogenous form, but their use is encouraged over fossil fuels to reduce green house gases. Biomass fuels also are a renewable resource, the use of which conserves fossil fuels. Discouraging their use by requiring the application of unreasonable output-based allocations is counterproductive.

And finally, economics exists as one of the main drivers for output-based emission allocations. Within the utility industry, there historically has been less inherent economic reason to operate more efficiently, since the rate structure virtually guarantees that companies generate a profit. However, this "economic incentive" is unnecessary in the industrial sector, where companies are automatically penalized for inefficiency because they cannot pass their operating costs on to consumers.

All of the above differences suggest that EPA rethink its efforts to apply output-based emission limitations to industrial units. Our comments on EPA's specific questions regarding steam measurement follow.

Steam Measurement Equipment

What percentage of industrial units measure steam output?

The percentage of industrial units currently measuring steam output likely is quite high, as this measurement allows an operator to determine the amount of steam available and use the steam for multiple purposes while allocating its use for accounting purposes. Steam capacity also is a common parameter addressed in air quality permits and often is limited by the permit. However, small, single-use industrial boilers and those not permitted are not as likely to possess steam measurement devices. It should be noted that steam from the vast majority of industrial boilers, when measured, is measured using standard industrial-grade instrumentation which is considerably less expensive than instrumentation sanctioned by ASME standards.

Do most industrial units measure pressure and temperature as part of measuring steam output?

Most larger industrial units measure pressure and temperature, particularly if steam is produced at superheated conditions. Pressure and temperature are fundamental parameters tracked for safety and boiler efficiency. Most industrial boilers do not measure steam quality, because there has never been a reason to do so.

Steam can be measured on a gross or net basis. Many boilers, particularly solid fuel boilers (e.g., using wood and/or coal for fuel), use some steam taken from the boiler ahead of the steam flowmeter for soot blowing. This is one of the factors that causes a difference between gross and net output.

Is the accuracy of steam (thermal) output measurement comparable to that of electricity (1-2% of full scale)?

Steam measurement is less accurate than electricity measurement, but the quality is a function of both the type/quality of instrumentation installed and how well it is calibrated and maintained. The accuracy also varies considerably depending on the installation layout and the devices used for measurement. A high level of accuracy has not historically been needed where the steam use is all internal, as is the case for most industrial boilers in the forest products industry. Typical steam flow measurement in the forest products industry employs

an orifice-type device, which has an accuracy of approximately 5-8% when properly installed and maintained. Use of a flow nozzle device might yield a 3-5% accuracy range, but these are less commonly used.

What quality assurance procedures do plants use to ensure the accuracy of steam measurement?

Larger manufacturing facilities are more likely to have personnel devoted to the maintenance of instrumentation, which would include steam measurement equipment. Steam flow measurement is used for boiler control and must be maintained at a level of accuracy sufficient for that purpose.

Are there standards that apply to measurement of steam, including quality assurance procedures (e.g., ASME or ANSI standards)? If so, are these standards widely used by industry?

ASTM does have standards for measurement of steam in boilers. However, the instrumentation required by the method is very expensive and the accuracy provided by these standard procedures is not required for industrial boilers. Industrial boilers generally rely on less costly instrumentation which provides the degree of accuracy needed by the company.

Net Versus Gross Steam Output

Are steam output measurements for an industrial unit usually on a gross basis, a net basis, both, or neither?

Neither. Gross output includes steam used for soot-blowing, for heating boiler feedwater and combustion air, and (sometimes) for driving mechanical steam turbines used to propel combustion air fans and boiler feedpumps. Steam flow from an industrial boiler is typically, but not always, measured after the sootblowing steam is taken off but before steam is taken off for the other auxiliaries mentioned above.

Is there an equivalent of net electricity for an industrial boiler (that is, an output that is sold by the company)? If so, what is it?

No, for the following reasons:

1. Most industrial boilers are not used to generate electricity.

2. Most industrial boilers used to generate electricity generate it for internal consumption, not for sale.

3. For industrial boilers used to generate electricity, only about 10% of the energy in the steam is used for electricity, while the rest is used in the manufacturing process.

4. Industrial boilers that generate electricity generate it in two modes, "back-pressure" and "condensing". There is a difference of about 4 to 1 in the amount of fuel it takes to generate electricity in the two modes. No two plants generate back-pressure and condensing power in the same ratio.

5. State-of-the-art combustion efficiencies of which industrial boilers are capable, depending on the fuel used, range from about 55% to about 85%. This means that the heat input required to generate a unit of steam output varies from 1.18 to 1.82 units in different boilers.

How would an industrial plant determine or measure net output for a unit?

By measuring gross steam output and subtracting from it the steam used for boiler auxiliaries. However, steam used by all the auxiliaries is not always measured.

Commercial Value of Steam

How is steam or thermal energy useful in industrial processes/used within a plant?

As discussed above, steam and/or thermal energy can be used in a multitude of different ways, including direct or indirect heat input to a process or chemical reaction, material drying, evaporation, electrical energy production, motive force (i.e., steam driven fans and drives), running refrigeration equipment, etc.

How do industrial plants recover the cost of generating steam or thermal energy?

Industrial plants treat the costs of generating steam as one of many manufacturing costs, recoverable through the sale of products to customers. Unlike utilities, where the "product" sold is steam or electricity, industrial facilities usually do not precisely quantify steam generation costs, since such costs are only one of several that go into the cost of the final product. In addition, much of the steam is generated from internally recovered materials (e.g., wood residuals, black liquor) that are not "purchased" separately from other raw materials.

Do industrial plants sell thermal energy?

A small number of industrial plants sell thermal energy, as opposed to energy companies whose primary business involves the sale of electricity and thermal energy. Some manufacturing facilities sell thermal energy to adjacent facilities. Since steam and thermal energy cannot be transported long distances, they typically are not considered items of commerce.

Appropriateness of Comparing and Converting Steam and Electric Output

Should steam output be converted to electrical output? If so, which method should be used to convert steam energy to its electrical power equivalent? If steam energy were not converted, how could emission limitations be treated for cogenerators?

Steam output cannot be converted to electrical output in any way that makes sense or has any useful purpose. If steam output data were not converted, States could base cogenerators' emission limitations on the heat input of the boiler.

How can steam be treated equitably for industrial boilers?

The important issue is not how steam is used, but the amount and type of fuel burned or the heat input to the boiler. Cogenerators produce useful output, in the form of electricity and heat or steam, at a much higher thermal efficiency than the typical electric utility steam generator which produces only electricity. The main reason for this difference is the large quantity of condensing losses that utility power stations discard when converting high-pressure steam to electricity. Paper mills condense only a small percentage of the boiler steam when generating electricity, since most of it is employed as process steam. As noted earlier, the efficiency for industrial boilers, at least in the forest products industry, is evident in the high level of "re-use" of thermal energy, rather than in the initial conversion of fuel to steam in the boiler itself.

What assumptions, if any, should be made about the efficiency of conversion from steam output to electrical output?

Industrial boilers used to cogenerate electricity produce two products, process steam and electricity. The efficiency with which the electricity is produced can be determined by subtracting the fuel which otherwise would have been used to produce the process steam only, from the total amount of fuel used to produce both the process steam and electricity. The result of this subtraction is the fuel used to generate the electricity. This can be expressed in terms of British Thermal Units, or Btus, per kilowatt-hour of electricity produced. This number, technically called the "heat rate", can be directly compared to any other means of producing electricity by conversion of the energy in a fuel. It is generally less than half of the heat rate, or energy consumed to produce a unit of electricity by utility plants. However, it is different for each plant, depending primarily on the fuel used and the corresponding combustion efficiency of the boiler. As previously pointed out, combustion efficiencies can vary from 55% for waste fuels to 85% for some fossil fuels.

If steam output data were not available from industrial boilers, how would States allocate allowances to cogenerators?

If steam output data were not available for industrial units, States could allocate allowances to cogenerators based on fuel input. As noted previously, such fuel input data would have to be adjusted for fuel type and for the pressure and temperature of the steam generated. States in this case would have to identify reasonable adjustment factors for the various types of fuel used within the State's industrial sector.

Conclusion

As stated earlier, the whole concept of output-based allocations for industrial boilers, and hence the need for steam output conversions, is unnecessary for the purpose of providing economic incentives to increase the efficiency of industrial units, where costs must be absorbed in the profit margin rather than passed on to consumers. In addition, EPA must realize that air emissions are a function of the fuel and heat input and not necessarily the output of a boiler. Finally, as emphasized in these comments, the concept simply may be unworkable in many cases.

Before proceeding any further with this concept, it is imperative that EPA obtain appropriate and representative knowledge about industrial steam generation. In its efforts to prepare guidance for States on the application of output-based emission limitations, EPA would be well served by involving Agency staff with mechanical or chemical engineering and industrial steam generation experience.

In closing, AF&PA has serious concerns regarding the appropriateness of applying output-based emission allocations to industrial units, particularly in the context of NO_X SIP call implementation efforts. However, we appreciate the opportunity to comment on the range of steam measurement issues as they relate to the industrial sector, and we look forward to continued collaboration with EPA on these issues. If you have any questions regarding the above comments, please feel free to call me at 202/463-2780.

Sincerely,

Katharine J. Hornbarger
Manager, Air Quality Program